

knowledge of the local flora. Besides this *List*, which stands as Mr. Batchelder's most important technical publication in botany, frequent notes from his pen were published in RHODORA, and his name is familiar to New England botanists as the author of the combination *Glyceria borealis* (Nash) Batchelder.

MANHASSET, NEW YORK.

NOTES ON CONNECTICUT MOSSES,—III.

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IN his last paper on Connecticut mosses ¹ the writer called attention to the northwestern part of the state, and especially to the town of Salisbury, as a favorable collecting ground. At that time eighteen species of hepatics and mosses were known from no other locality. This number has since been raised to twenty-six. In the present series of notes eleven mosses are recorded from Connecticut for the first time. Of these, nine represent additions due to recent explorations, while the remaining two have previously been reported under other names.

FISSIDENS VIRIDULUS (Swartz) Wahl. Bolton and Danbury (G. E. N.); Hamden (J. A. Allen, 1880); East Haven (Kleeberger). For some time it has been evident to the writer that the Connecticut material which has been passing as *F. incurvus* Swaegr. (including *F. minutulus* Sull.)² comprised a number of distinct forms. Recently all of the available Connecticut specimens, some sixteen packets in all, were submitted to Mr. H. N. Dixon of Northampton, England, for examination, and some of his observations will be of interest to American bryologists. The broad conclusion that he comes to is that there is at any rate none of the true *F. incurvus* in the lot. Moreover, none of the specimens seem to agree with the descriptions of *F. minutulus*. Mr. Dixon divides the Connecticut specimens into several groups, one of which, as already indicated, he assigns definitely to *F. viridulus*. A second group, comprising specimens collected by the writer in Salisbury and North Branford, he refers to *F. viridulus* var. *Lylei* Wils. (= *F. exiguus* Sull.). The remaining

¹ RHODORA 13: 40. 1911.

² See Evans and Nichols: *Bryophytes of Connecticut* 104. 1908.

groups he hesitates to name definitely at the present time, although he remarks that some of the specimens very likely represent forms of *F. viridulus* while others approach *F. obtusifolius*.

F. incurvus and *F. viridulus* are both common and well known British species. The probability that the latter is widely distributed in this country has not, however, been generally appreciated. By many of the European writers of the present day the two are considered conspecific, but both Braithwaite and Dixon consider them distinct. They are indeed uncomfortably close, but in a case like this it is necessary to emphasize small dissimilarities. The most striking difference between the two, and one that makes them appear distinct at a glance, is seen in the form and degree of inclination of the capsules. In its typical form *F. incurvus* possesses a strongly curved and cernuous or horizontal capsule, while in *F. viridulus* the capsule is usually symmetric and erect or only slightly inclined. In a recent letter Mr. Dixon remarks that he will not venture to say how far the curving of the capsule is a constant character; there are indications that it may not be; there are certainly intermediate forms. But so far as the character goes the writer, after examining a number of British specimens, agrees with Mr. Dixon that there is nothing among the Connecticut specimens like the typical *F. incurvus* of Europe. Incidentally, the habitats of the two mosses are suggestive. The European manuals describe *F. incurvus* as growing commonly on clay banks and roadsides or in fields. The American plant, on the other hand, is ordinarily associated with moist rocks and only rarely does it occur on earth; in the writer's experience it is to be looked for on boulders in streams or on rocks in shady ravines, but never in open fields. The variety *Lylei* is a very small plant whose leaves, except on the vaginant lamina, lack the narrow-celled border which is so characteristic in the typical form of the species.

GYMNOSTOMUM RUPESTRE Schleich. On limestone in moist shaded ravines, altitude about 800 feet, Salisbury (G. E. N., 1911). Determined by Mrs. E. G. Britton and Dr. A. LeR. Andrews. The Connecticut specimens are rather short, hardly 1 cm. in height, and presented somewhat the same general field aspect as a *Rhabdoweisia*. The nearest relative among our local mosses and the only thing with which there is really any danger of confusing it is *Hymenostylium curvirostre*. The generic distinction between these two seems to be derived from the fact that in *Gymnostomum* the lid falls off from the

capsule at maturity, whereas in *Hymenostylium* the lid remains attached to the capsule by the dried-up columella. The leaf characters of the species in question are also different. In *G. rupestre* the margin is plane or nearly so, and the cells in the apical region are small and poorly defined; in *H. curvirostre* one or both margins are recurved below, while the cells in the apical region are larger and distinct. The present species ranges more or less extensively through Canada and reaches southward, principally along the mountains, into the northern United States. It has previously been reported from at least two of the New England States, Vermont and Massachusetts, and is common to Europe, Asia, and Africa. The spores ripen in late summer.

TORTULA MUCRONIFOLIA Schwaegr. On shaded calcareous shale ledges along the Farmington River, altitude 100 feet, Windsor (collected and determined by Miss Lorenz, 1911). This is the only smooth-leaved *Tortula* that is likely to be found in New England. The species is monoicous so that capsules are usually present, the spores maturing in summer. It should be easy to recognize in the field by the smooth hair-points on the leaves and by the peculiar peristome, which conforms to the familiar *Barbula* type but has a basal membrane nearly half the height of the entire structure. *T. mucronifolia* has been recorded from Vermont and Massachusetts; it is widely scattered through Canada and the northern United States, extending southward in the West to Colorado, Nevada, and California, and is common to both Europe and Asia.

TORTULA RURALIS (L.) Ehrh. On dry sandy soil over limestone, altitude about 750 feet, Salisbury and Canaan (G. E. N., 1911). During dry weather there is at least a superficial resemblance between this plant and the short, sterile form of *Polytrichum piliferum* which is common in similar habitats. This is due mainly to the long, hyaline arista which is such a conspicuous feature of the leaves in both mosses. In *T. ruralis* and in the closely related *T. montana* this arista is thickly beset with spiny teeth; in the other Connecticut species — *T. muralis*, *T. papillosa*, *T. mucronifolia* — it is smooth. *T. ruralis* and *T. montana* can be distinguished from one another by the following leaf characters: *T. ruralis* — leaves squarrose when moist, margin strongly recurved almost to the apex, upper cells 12–16 μ in diameter; *T. montana* — leaves erect-spreading when moist, margin recurved below but plane in the apical region, upper cells 9–10 μ in diameter. *T.*

ruralis is one of the most cosmopolitan mosses, being known from all of the great continental areas. In temperate North America it is widely distributed, but it is apparently much commoner in the West than in the East. The only other New England stations for it that the writer has found record of are in Vermont and Massachusetts. Fruit, when developed, matures in summer, but the plants are commonly sterile.

RACOMITRIUM SUDETICUM (Funck) Br. & Sch. Mr. R. S. Williams has referred to this species the specimens recently described by the writer¹ as *R. fasciculare*. In general aspect the two species are often similar. But in *R. sudeticum* some at least of the leaves possess short, denticulate, hyaline hair-points, while the upper leaf-cells are roundish-quadrate in shape. The leaves of *R. fasciculare* are always obtuse, never developing hyaline points, and throughout the leaf the cells are from three to five times as long as broad. *R. sudeticum* is quite common in the Salisbury hills and is known from all of the New England States except Rhode Island. Its general distribution is similar to that already given for *R. fasciculare*.

ANOECTANGIUM LAPPONICUM Hedw. On precipitous schistose rocks in a moist ravine, altitude 1600 feet, Salisbury (G. E. N., 1911). Fortunately this moss usually fruits abundantly and the capsules, strongly plicate when dry and empty and barely emergent above the perichaetial bracts, render it easy of recognition. The other Connecticut species, *A. Mougeotii*, is dioicous and rarely fruits. *A. lapponicum* is autoicous, the antheridial buds being situated in the axils of the upper leaves and readily demonstrable in most cases. It has been recorded from Maine, New Hampshire, and Vermont, but is evidently much less frequent in New England than the other species. It ranges throughout the northern part of this continent, with a southerly extension in the East as far as the mountains of Alabama, and is found also in Europe and Asia. The capsules mature in late summer.

LEUCODON SCIUROIDES (L.) Schwaegr. On the bark of a tree, altitude 150 feet, Ledyard (G. E. N., 1911). As Grout observes,² this species can usually be recognized in the field by the flagelliform branches which are frequently produced in such abundance as to cause the plant to appear deformed. The leaves differ from those of the

¹ RHODORA 13: 43. 1911.

² Mosses with Hand Lens and Microscope 389. 1910.

other two American species, *L. julaceus* and *L. brachypus*, in their more narrowly acuminate, longer-celled and nearly entire apices. On this continent *L. sciuroides* appears to be occasional through eastern Canada, while it has been reported from New York and Pennsylvania and from all of the New England States but Rhode Island. It is a common European moss and is also known from Asia and Africa.

ELODIUM BLANDOWII (Web. & Mohr) Broth. In a calcareous swamp, altitude 750 feet, Salisbury (A. W. Evans, 1911). The larger size, more ascending habit, and regularly pinnate branching give to this handsome moss a quite different appearance in the field from the common and closely related *E. paludosum*, the only other American representative of the genus. When dry the plants bear a superficial resemblance to *Thuidium abietinum*, but the different habitats of the two, together with the softer texture of the present species, preclude any possibility of confusion. Fruit is usually borne in more or less abundance, the spores maturing in May or June. According to Best¹ the American distribution is as follows: Greenland; Labrador; Canada and British Columbia; southward to Idaho; Colorado; New York; Vermont. It has now been reported from all of the New England States but Rhode Island. Native to Europe and Asia.

DREPANOCLADUS PSEUDOFUITANS (San.) Warnst. At the margin of Twin Lakes, altitude 750 feet, Salisbury (G. E. N., 1911). Determined by Warnstorf. This is one of those variable and intergrading forms which group themselves so closely about *D. subaduncus* (L.) Warnst. (= *D. aduncus* of most authors). Whether or not it has justifiable claim to specific rank seems open to question. Renauld,² Mönkemeyer,³ and Loeske,⁴ after a critical study of numerous specimens both in the field and in herbaria, are of the opinion that this and similar forms, such as *D. Kneiffii* and *D. gracilescens*, represent merely varieties of *D. subaduncus* which are due largely to seasonal changes and ecological factors. Dixon, Grout, and Brotherus support this same view. But on the other hand equally careful students, prominent among whom are Limpricht and Warnstorf, regard many of these forms as distinct species. In its typical form *D. pseudo-*

¹ Bull. Torr. Bot. Club **23**: 89. 1896.

² Rev. Bryol. **33**: 89-100. 1906; **34**: 7-14. 1907.

³ Sitzungsber. d. Naturf. Gesellsch. zu Leipzig 1-25. 1906.

⁴ Zur Morphologie und Systematik der Laubmoose 24. 1910.

fluitans is more robust than any of the other species in the *subaduncus* group, but it bears a marked resemblance to *D. Kneiffii* and the two are very liable to be confused. In *D. pseudofluitans* the leaves often reach a length of 5 mm. and throughout the plant are pretty uniformly ovate-lanceolate in shape, tapering gradually toward the apex. In *D. Kneiffii* the leaves almost never exceed 4 mm. in length and are dimorphic; of the two types of leaves one resembles those of *D. pseudofluitans* in shape, but the other is broadly ovate and tapers rather abruptly. Both kinds of leaves are usually present in the same individual. Furthermore, in *D. pseudofluitans* the leaves near the tip of the shoot have a tendency, which is usually not evident in *D. Kneiffii*, to wrap themselves more or less loosely around the stem. The length of stem is also said to differ, but specimens of each species have been collected by the writer in which the stem measured fully a foot in length. On the whole, however, the distinctions which can be brought out in a description are rather unsatisfactory for, as Loeske remarks,¹ the two forms are more readily separated by their general habit than through any anatomical differences. *D. pseudofluitans* sometimes grows in ditches or in shallow depressions which are dry during the summer, but in such habitats it is poorly developed. It thrives most luxuriantly in places where it is almost completely submerged throughout the year. In a locality of this sort along the lake-ward margin of a swamp which borders one of the Twin Lakes there are pure mats of *D. pseudofluitans* many square yards in extent. The range of this species has not been definitely established, but for the present it may be assumed that its distribution coincides approximately with that of *D. subaduncus*. So far as the writer is aware no other New England stations have been published.

In passing it is worthy of note that this moss, together with *D. Sendtneri* var. *Wilsoni*², which occurs in the same locality, may be of considerable importance locally in connection with the production of marl. Davis has shown³ that the extensive marl accumulations, which are a well known feature of lakes in limestone regions, are largely the result of plant activity, and he has cited a number of algae and seed plants which play an important rôle in this connection. In

¹ Moosflora des Harzes 308. 1903.

² *D. Wilsoni* Schimp. is often treated as a separate species, but by Warnstorf it is regarded merely as a variety of *D. Sendtneri*.

³ Geol. Surv. Mich. 8³: 65-100. 1903.

the present case the leaves and stems of the two mosses referred to above were covered with a thin, loose crust of calcium carbonate which they had apparently precipitated from the water, and which gave them an unnatural grayish-white appearance.

DREPANOCLADUS VERNICOSUS (Lindb.) Warnst. In a boggy swamp at the margin of Twin Lakes, altitude 750 feet, Salisbury (G. E. N., 1911). Determined by Warnstorf. With the exception of *D. scorpioides* this is the only one of the *Drepanocladi* in which the stem lacks a central strand. It also differs from all the other *Drepanocladi* thus far recorded from Connecticut in the total absence of specially differentiated alar cells. On the whole *D. vernicosum* is a northern moss and has been rather infrequently collected in the United States, the only stations in the East that have come to the writer's attention being in Ohio, western New York, eastern Pennsylvania, northern New Jersey, and northwestern Vermont. It is found in both Europe and Asia.

According to the majority of the European authorities this moss is confined to swamps and bogs that are free from lime; so that on first thought it would hardly be looked for in the Twin Lakes swamp which overlies marl deposits of considerable depth. So far as the writer has observed, however, it does not occur around the lakeward border of the swamp but grows at a distance from the open water, in places where a considerable thickness of peat has been laid down. And this seemingly restricted distribution suggests a possible explanation for the anomaly. As has been pointed out by Transeau¹ humic acid, which is particularly abundant in peaty soils, forms insoluble compounds with alkaline earths. So that where there is an appreciable depth of peat the vegetation growing at the surface may be affected little or not at all by the calcareous nature of the substratum, owing to the fact that whatever lime may be dissolved in the water will be precipitated through the action of the humic acid before it has penetrated far into the peat.

CLIMACIUM DENDROIDES (L.) Web. & Mohr. On moist banks in a ravine, altitude 1600 feet, Salisbury (G. E. N., 1911). Determination verified by Dr. Grout. The seeming rarity of this moss in most parts of the East may in all probability be accounted for by the fact that it is usually mistaken for the better known species, *C. americanum*, which it closely resembles in habit and general appearance.

¹ Bot. Gaz. 40: 375. 1905.

But the branch leaves and capsules in the two plants are quite distinct. In *C. americanum* the leaf bases have broad, crispate auricles, and a large proportion of the leaves are acute. In *C. dendroides* the leaves may be slightly auriculate but the auricles are usually flat, while the majority of the leaves are very obtuse. The areolation also differs, the median cells in the former being from five to seven, in the latter from seven to ten times as long as broad. The capsules of *C. dendroides* ripen in late autumn and are much smaller than those of *C. americanum*. It probably occurs throughout northern North America and has been accredited to Maine, New Hampshire, and Vermont. Also common to Europe and Asia.

In addition to the mosses listed above there are a number of new stations for species which have heretofore been known from but one or two localities. These are as follows: *Fissidens bryoides* forma *inconstans* Schimp., Farmington (Miss Lorenz); *Encalypta ciliata*, Salisbury (A. W. Evans); *Schwetschkeopsis denticulata*, Colebrook (G. E. N.); *Myurella julacea*, Salisbury (Miss Lorenz); *Thuidium abietinum*, Canaan (G. E. N.); *Brachythecium acuminatum* and *Amblystegium vacillans*, Salisbury (G. E. N.). *Anacamptodon splachnoides* may also be recorded from two more towns, Colebrook and North Branford (G. E. N.). At the present writing 309 species of mosses are known to occur within the limits of the state. Three species have been dropped from the list and thirty have been added during the last four years. During the same time the number of hepatics has been increased from 107 to 128, thus making a total at this time of 437 bryophytes in Connecticut.

In conclusion attention is called to a number of errors which have been noted in the Bryophytes of Connecticut. P. 101, *Dicranum fulvum* Hook. should read *D. montanum* Hedw.; synonym should be omitted¹: p. 109, in the key to species of *Tortula* the characters should be interchanged to read as follows: *T. montana* — midrib excurrent into a long *toothed* hair-point; *T. muralis* — midrib excurrent into a long *smooth* hair-point. P. 111, in the key to species of *Grimmia* the characters of the leaf-cells in *G. conferta* and *G. apocarpa* have been exactly transposed. Also, the Stafford station for *Polytrichum alpinum*, reported in the last series of Notes², must be omitted; the mistake was due to a confusion of labels.

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¹ Already noted by Howe: *Torreyana* 9: 37. 1909.

² RHODORA 13: 46. 1911.